WHAT IS CLAIMED IS:

1. A total internal reflection fluorescence microscope comprising:

at least one objective lens which takes light from a specimen;

an image pick-up device which picks up an image of the light taken into the objective lens;

an observation optical path via which the light taken into the objective lens is condensed onto the image pick-up device;

a condenser lens which is disposed in a position facing the objective lens via the specimen and which has a numerical aperture that makes possible total internal reflection illumination and which guides a transmitted illuminative light into the specimen; and

a laser introduction section which allows a laser beam to be incident upon a direction crossing the optical path of the transmitted illuminative light at right angles and which introduces the incident laser beam on a condenser lens side in the vicinity of an outermost part of the transmitted illuminative light path.

2. The total internal reflection fluorescence microscope according to claim 1, wherein the laser introduction section comprises:

a reflection mirror which is movably disposed in the vicinity of an outermost part of the transmitted

illuminative light path on an incidence side of the transmitted illuminative light in the condenser lens and which reflects the laser beam to introduce the laser beam on the condenser lens side; and

a mirror moving section which moves the reflection mirror in a direction parallel to an introduction direction of the laser beam.

3. The total internal reflection fluorescence microscope according to claim 1, wherein the laser introduction section comprises:

a laser oscillation unit which outputs the laser beam;

an optical fiber which transmits the laser beam output from the laser oscillation unit; and

a condensing lens which converts the laser beam diverged and emitted from an emission end of the optical fiber into a convergent light to condense the light in the vicinity of a front focal position of the condenser lens.

4. The total internal reflection fluorescence microscope according to clam 3, wherein the laser introduction section comprises a conversion lens unit which converts a numerical aperture of the laser beam incident upon a condensing position without changing the condensing position of the laser beam by the condensing lens.

5. The total internal reflection fluorescence

microscope according to claim 4, wherein the conversion lens unit is detachably inserted between the emission end of the optical fiber and the condensing lens.

6. The total internal reflection fluorescence microscope according to claim 4, wherein the conversion lens unit includes a lens group which converts a numerical aperture of the laser beam incident upon the condensing position.

7. The total internal reflection fluorescence microscope according to claim 4, wherein the conversion lens unit comprises:

a convex lens which converts the numerical aperture of the laser beam diverged and emitted from the emission end of the optical fiber; and

a concave lens which diverges the laser beam having the numerical aperture converted by the convex lens.

8. The total internal reflection fluorescence microscope according to claim 7, wherein the concave lens is movable in an optical path direction of the laser beam between the convex lens and the condensing lens.

9. The total internal reflection fluorescence microscope according to claim 5, further comprising:

a plurality of objective lenses having different observation magnifications;

an objective lens switching section which

selectively disposes one of the plurality of objective lenses on the observation optical path; and

a control section which controls inserting/detaching of the conversion lens unit between the emission end of the optical fiber and the condensing lens in accordance with the observation magnification of the objective lens disposed on the observation optical path.

10. The total internal reflection fluorescence microscope according to claim 9, wherein a plurality of objective lenses include objective lenses for high-magnification observation and for low-magnification observation, and

the control section inserts the conversion lens unit between the emission end of the optical fiber and the condensing lens in a case where the objective lens for high-magnification observation is disposed on the observation optical path, and detaches the conversion lens unit between the emission end of the optical fiber and the condensing lens in a case where the objective lens for low-magnification observation is disposed on the observation optical path.

11. The total internal reflection fluorescence microscope according to claim 10, wherein an irradiation range of the laser beam with respect to the specimen is allowed to agree with an observation range of the objective lens for high-magnification

observation in a case where the conversion lens unit is inserted between the emission end of the optical fiber and the condensing lens, and the irradiation range of the laser beam with respect to the specimen is allowed to agree with an observation range of the objective lens for low-magnification observation in a case where the conversion lens unit is detached between the emission end of the optical fiber and the condensing lens.

12. The total internal reflection fluorescence microscope according to claim 1, wherein the laser introduction section comprises a zoom lens unit which adjusts the condensing position of the laser beam in the vicinity of a front focal position of the condenser lens.

13. The total internal reflection fluorescence microscope according to claim 12, wherein the zoom lens unit comprises a lens group which adjusts the condensing position of the laser beam in the vicinity of the front focal position of the condenser lens.

14. The total internal reflection fluorescence microscope according to claim 12, wherein the zoom lens unit comprises:

a convex lens which converts the numerical aperture of the laser beam diverged and emitted from the emission end of the optical fiber; and

a concave lens which diverges the laser beam

having the numerical aperture converted by the convex lens.

15. The total internal reflection fluorescence microscope according to claim 14, wherein the convex lens is movable in an optical path direction of the laser beam between the fiber emission end and the condensing lens.

16. The total internal reflection fluorescence microscope according to claim 14, wherein the concave lens is movable in an optical path direction of the laser beam between the convex lens and the condensing lens.

17. The total internal reflection fluorescence microscope according to claim 14, further comprising:

a control section which determines a moving position of the concave lens to adjust the condensing position of the laser beam in the vicinity of the front focal position of the condenser lens in accordance with the positional movement of the convex lens and which controls movement of the convex lens and the concave lens based on information of the determined moving position of the concave lens.

18. The total internal reflection fluorescence microscope according to claim 13, further comprising:

a plurality of objective lenses having different observation magnifications;

an objective lens switching section which

selectively disposes one of the plurality of objective lenses on the observation optical path; and

a control section which determines a relative positional relation of the lens group disposed in the zoom lens unit in each optical axis direction in accordance with an observation magnification of the objective lens disposed on the observation optical path.

19. The total internal reflection fluorescence microscope according to claim 18, wherein the zoom lens unit comprises: a convex lens which converts the numerical aperture of the laser beam diverged and emitted from the fiber emission end of the optical fiber; and a concave lens which diverges the laser beam having the numerical aperture converted by the convex lens, and

the control section determines a moving position of the concave lens to adjust the condensing position of the laser beam in the vicinity of the front focal position of the condenser lens in accordance with the positional movement of the convex lens, and controls movement of the convex lens and the concave lens based on information of the determined moving position of the concave lens.

20. A total internal reflection fluorescence microscope comprising:

an objective lens which takes light from a

specimen;

a plurality of image pick-up devices which pick up an image of the light taken into the objective lens;

observation optical paths via which the light taken into the objective lens is condensed onto each of the plurality of image pick-up devices;

an optical dividing system which is disposed on the observation optical path to divide the light from the specimen in the observation optical path by the plurality of image pick-up devices depending on optical characteristics;

a condenser lens which is disposed in a position facing the objective lens via the specimen and which has a numerical aperture that makes possible total internal reflection illumination and which guides a transmitted illuminative light into the specimen; and

a plurality of laser introduction sections which allow a plurality of laser beams to be incident upon a direction crossing the optical path of the transmitted illuminative light at right angles and which introduce the plurality of incident laser beams on a condenser lens side in the vicinity of an outermost part of the transmitted illuminative light path.

21. The total internal reflection fluorescence microscope according to claim 20, wherein the plurality of laser introduction sections comprise:

a plurality of reflection mirrors which are

movably disposed in the vicinity of an outermost part of the transmitted illuminative light path on an incidence side of the transmitted illuminative light in the condenser lens and which reflects the laser beam to introduce the laser beam on the condenser lens side; and

a plurality of mirror moving sections which move the plurality of reflection mirrors in a direction parallel to an introduction direction of the laser beam.

22. The total internal reflection fluorescence microscope according to claim 20, wherein the plurality of laser introduction sections comprise:

a plurality of laser oscillation units which output the laser beams;

a plurality of optical fibers which transmit the plurality of laser beams output from the plurality of laser oscillation units; and

a plurality of condensing lenses which convert the plurality of laser beams diverged and emitted from emission ends of the plurality of optical fibers into convergent lights to condense the lights in the vicinity of a front focal position of the condenser lens.

23. The total internal reflection fluorescence microscope according to clam 22, wherein the plurality of laser introduction sections comprise a plurality of

conversion lens units which convert a numerical aperture of the laser beam incident upon a condensing position without changing the condensing position of the laser beam by the condensing lens.

24. The total internal reflection fluorescence microscope according to claim 23, wherein the plurality of conversion lens units are detachably inserted between the emission end of the optical fiber and the condensing lens.

25. The total internal reflection fluorescence microscope according to claim 23, wherein the plurality of conversion lens units include a plurality of lens groups which convert a numerical aperture of the laser beam incident upon the condensing position.

26. The total internal reflection fluorescence microscope according to claim 23, wherein the plurality of conversion lens units comprise:

a plurality of convex lenses which convert the numerical apertures of the laser beams diverged and emitted from the emission ends of the optical fibers; and

a plurality of concave lenses which diverge the laser beams having the numerical apertures converted by the convex lenses.

27. The total internal reflection fluorescence microscope according to claim 26, wherein the plurality of concave lenses are movable in optical path

directions of the laser beams between the convex lenses and the condensing lenses.

28. The total internal reflection fluorescence microscope according to claim 24, further comprising:

a plurality of objective lenses having different observation magnifications;

an objective lens switching section which selectively disposes one of the plurality of objective lenses on the observation optical path; and

a control section which controls inserting/detaching of the plurality of conversion lens units between the emission ends of the optical fibers and the condensing lenses in accordance with the observation magnification of the objective lens disposed on the observation optical path.

29. The total internal reflection fluorescence microscope according to claim 28, wherein a plurality of objective lenses include objective lenses for high-magnification observation and for low-magnification observation, and

the control section inserts the conversion lens units between the emission ends of the optical fibers and the condensing lenses in a case where the objective lens for high-magnification observation is disposed on the observation optical path, and detaches the conversion lens units between the emission ends of the optical fibers and the condensing lenses in a case

where the objective lens for low-magnification observation is disposed on the observation optical path.

30. The total internal reflection fluorescence microscope according to claim 29, wherein an irradiation range of the laser beam with respect to the specimen is allowed to agree with an observation range of the objective lens for high-magnification observation in a case where the conversion lens units are inserted between the emission ends of the optical fibers and the condensing lenses, and the irradiation range of the laser beam with respect to the specimen is allowed to agree with an observation range of the objective lens for low-magnification observation in a case where the conversion lens units are detached between the emission ends of the optical fibers and the condensing lenses.

31. The total internal reflection fluorescence microscope according to claim 20, wherein the plurality of laser introduction sections comprise a plurality of zoom lens units which adjust the condensing position of the laser beam in the vicinity of a front focal position of the condenser lens.

32. The total internal reflection fluorescence microscope according to claim 31, wherein the plurality of zoom lens units comprise a plurality of lens groups which adjust the condensing position of the laser beam

in the vicinity of the front focal position of the condenser lens.

33. The total internal reflection fluorescence microscope according to claim 31, wherein the plurality of zoom lens units comprise:

a plurality of convex lenses which convert the numerical apertures of the laser beams diverged and emitted from the fiber emission ends of the optical fibers; and

a plurality of concave lenses which diverge the laser beams having the numerical apertures converted by the convex lenses.

34. The total internal reflection fluorescence microscope according to claim 33, wherein the plurality of convex lenses are movable in optical path directions of the laser beams between the fiber emission ends and the condensing lenses.

35. The total internal reflection fluorescence microscope according to claim 33, wherein the plurality of concave lenses are movable in optical path directions of the laser beams between the convex lenses and the condensing lenses.

36. The total internal reflection fluorescence microscope according to claim 33, further comprising:

a control section which determines a moving position of the concave lens to adjust the condensing position of the laser beam in the vicinity of the front

focal position of the condenser lens in accordance with the positional movement of the convex lens and which controls movement of the convex lens and the concave lens based on information of the determined moving position of the concave lens.

37. The total internal reflection fluorescence microscope according to claim 32, further comprising:

a plurality of objective lenses having different observation magnifications;

an objective lens switching section which selectively disposes one of the plurality of objective lenses on the observation optical path; and

a control section which determines a relative positional relation of the lens groups disposed in the zoom lens units in each optical axis direction in accordance with an observation magnification of the objective lens disposed on the observation optical path.

38. The total internal reflection fluorescence microscope according to claim 37, wherein the plurality of zoom lens units comprise: a plurality of convex lenses which convert the numerical apertures of the laser beams diverged and emitted from the fiber emission ends of the optical fibers; and a plurality of concave lenses which diverge the laser beams having the numerical apertures converted by the convex lenses, and

the control section determines moving positions of

the concave lenses to adjust the condensing positions of the laser beams in the vicinity of the front focal positions of the condenser lenses in accordance with the positional movements of the convex lenses, and controls movement of the convex lenses and the concave lenses based on information of the determined moving positions of the concave lenses.

39. The total internal reflection fluorescence microscope according to claim 20, wherein a plurality of laser introduction sections are disposed radially centering on the transmitted illuminative light path and in a direction crossing the transmitted illuminative light path at right angles.

40. The total internal reflection fluorescence microscope according to claim 20, further comprising:

at least one optical path length adjustment section which is disposed on at least one divided observation optical path among the plurality of divided observation optical paths divided by the optical dividing system and which extends/contracts the optical path length.

41. The total internal reflection fluorescence microscope according to claim 40, wherein the optical path length adjustment section comprises:

a fixed prism group fixed/disposed on the divided observation optical path; and

a movable prism which is movable in a leaving

direction and an approaching direction with respect to the fixed prism group.

42. The total internal reflection fluorescence microscope according to claim 40, further comprising:

a control section which calculates/processes an extension/contraction of the optical path length by the optical path length adjustment section.

43. The total internal reflection fluorescence microscope according to claim 20, further comprising:

a plurality of shutters disposed in the plurality of laser introduction sections; and

a control section which controls the opening/closing the plurality of shutters to control introducing or blocking of the laser beam.

44. The total internal reflection fluorescence microscope according to claim 20, wherein the plurality of laser introduction sections comprise: at least two laser introduction sections which output the laser beams having the equal wavelength.